

## AMIODOXYL BENZOATE IN THE TREATMENT OF ARTHRITIS\*

By J. EDWARD HARBINSON, M. D.  
Woodland

DISCUSSION by George C. Hensel, M. D., San Francisco;  
George B. Worthington, M. D., San Diego.

YOUNG and Youmans<sup>1</sup> in 1926 were the first to report the use of ammonium ortho-iodoxybenzoate in the treatment of arthritis. Subsequent investigators<sup>2-13</sup> have reported over five hundred cases of arthritis treated by this drug. It is impossible to list these cases in one group on account of the wide variation in terminology and differences in opinion regarding the definition of the terms used, especially in the classification of chronic arthritis. Some investigators classify their cases of chronic arthritis on the basis of etiology, while others list them according to the pathological findings. In some articles both etiology and pathology are taken into consideration in grouping the cases, e. g.: infectious, atrophic, hypertrophic. This lack of universal nomenclature causes confusion in reviewing the literature and in discussing the subject.

Cecil and Archer<sup>14</sup> have adopted the classification of Nichols and Richardson<sup>15</sup> and have divided chronic arthritis into two groups—proliferative and degenerative.

Archer<sup>16</sup> believes that the rheumatoid arthritis of Garrod, the atrophic arthritis of Goldthwaite, the first great group of Ely, and the proliferative arthritis of Nichols and Richardson are different terms which describe the same pathological entity, and probably represent an infectious process. He also believes that the corresponding terms osteoarthritis, hypertrophic arthritis, second great group of Ely, and degenerative arthritis describe the same pathological condition and are probably the result of a noninfectious process. In the proliferative or infectious type the primary change is an inflammatory reaction of the synovial membrane. In the degenerative or noninfectious type the primary change is a degeneration of the joint cartilage.

This classification seems to correspond with the views of those who have made an intensive study of chronic arthritis, and will be used in this report.

### PHARMACOLOGICAL ACTION

The pharmacological action of sodium iodoxybenzoate was studied by Loevenhart and Grove<sup>17</sup> in 1911. They found that this substance oxidizes hemoglobin to oxyhemoglobin, and usually causes a more or less marked leukocytosis affecting especially the polymorphonuclear leukocytes. The fall in pressure in the typical cases was usually less marked than the pressure fall caused by iodosobenzoate. Iodoxybenzoate caused a rise of blood pressure in a larger percentage of the cases than did iodosobenzoate. It was not so depressing

on the heart as the latter drug, and an increase in cardiac output was the rule. Even though it may have caused as large an initial fall in blood pressure as iodosobenzoate, the return to normal was more rapid than when the latter drug was administered. They concluded that the fall in blood pressure was not due to cardiac effect. Sodium iodoxybenzoate did not act directly on the vessel wall of an isolated loop of intestine. Before severing the splanchnic nerve the volume of the loop increased while the blood pressure was falling. After cutting the splanchnics, the volume of the loop ran parallel to the blood pressure.

### PHYSIOLOGICAL ACTION

The experiments led to the conclusion that the lowering of blood pressure was caused by depression of the vasomotor center rather than direct action on the vessel. They believed that the rise in blood pressure, sometimes seen after administration, was mainly due to increased cardiac output; however, they could not exclude the possibility that, under certain conditions, the salt might stimulate the vasomotor center.

The characteristic effect on respiration was a temporary cessation of respiration entirely independent of blood pressure changes. This effect was sometimes confined only to a decrease in rate and depth of respiration. Evidence of stimulation of respiration was also noted.

Arkin<sup>18</sup> pointed out the bactericidal action *in vitro* of sodium iodoxybenzoate for *B. pyocyaneus*, *B. typhosis*, and *B. Coli*. Toward staphylococcus aureus it was five times less bactericidal than sodium iodosobenzoate.

Proteins did not influence its bactericidal action. Arkin concluded that the bactericidal action was due to the drug's oxidizing properties.

Hektoen<sup>19</sup> found that dogs receiving this substance intravenously produced more antibodies than control animals.

Amberg and Knox<sup>20</sup> demonstrated that sodium iodoxybenzoate diminished the intensity of a local allergic reaction. It did not influence the mechanism of the allergic reaction as such, but acted on the inflammatory processes due to products of the allergic reaction.

Arkin<sup>21</sup> noted the stimulating action of this substance on the phagocytosis of streptococci and staphylococci by human leukocytes in the presence of human serum. He believed that this stimulating effect on phagocytosis was related to the germicidal action of sodium iodoxybenzoate, which is also dependent on the oxygen combined with the iodine in the molecule. Substances which stimulate oxygen production readily stimulate phagocytosis.

Later this same author<sup>22</sup> reported the stimulation of production of hemolysin and agglutinin in rabbits when sodium iodoxybenzoate was given intravenously shortly after immunization. Arkin believed that the results showed a close relation-

\* From the Department of Medicine, Woodland Clinic, Woodland.

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ship between the production of immune bodies (antibodies) and oxidative processes.

Rohdenburg and Reich<sup>23</sup> recently confirmed the germicidal power of sodium iodosobenzoate and sodium iodoxybenzoate.

#### COMMERCIAL FORMS OF DRUG

Ammonium-ortho-iodoxybenzoate is now available as amiodoxyl benzoate. Before the preparation was accepted by the Council on Pharmacy and Chemistry, we used oxo-ate (Smith, Kline, French). Since its acceptance by the Council, amiodoxyl benzoate (Abbott) has been used. The two preparations gave similar results in all respects. We have given the preparation by the intravenous method exclusively. A preliminary injection of .5 gram was always given to test for hypersensitiveness or idiosyncrasy to the drug. The regular dose was one gram of the substance dissolved in 100 cubic centimeters of sterile physiological saline warmed to body temperature. The solution was used within one hour after being prepared and administered by a 100 cubic centimeter Luer syringe to which was attached rubber tubing about ten inches long, with a suitable glass adapter to fit the needle. The rubber tube and adapter filled with normal saline was attached to the needle after the latter was inserted into the vein, then 100 cubic centimeters of 1 per cent amiodoxyl benzoate was poured into the Luer and the plunger inserted. The rate of flow was regulated by pressure. The usual reaction of the test dose was a slight burning of the tongue and roof of the mouth. Many patients had no reaction of any character with this amount of drug. Occasionally a relatively severe reaction was noted after giving .5 gram. In this instance the next dose was administered cautiously, and the rate of injection modified according to the severity of the symptoms. We have not been able to prognosticate the severity of reaction. Patients complaining of severe symptoms with the test dose often had very little reaction from the full dose, and vice versa.

#### REACTIONS

After administration of 20 to 30 cubic centimeters of the 100 cubic centimeter solution, patients generally complained of a burning and stinging sensation at the base of the tongue, throat, and roof of the mouth, and burning sensation in the nose and eyes, with lacrimation and watery discharge from the nose. This sensation often spread over the whole body, giving a general sense of warmth with flushing of the face. The taste was usually described as peppery. A few of the patients sneezed, but this was not a usual reaction. Sweating of the face was noted occasionally. The burning sensation and peppery taste have been responsible for the adoption by patients of the nickname "Hot-Shot" as descriptive of the reactions from the treatment. Burning sensation in the epigastrium, and nausea with retching, were the chief symptoms in a few patients. Emesis was rarely observed. Patients rarely complained of sense of weight on the chest or sense of constriction and suffocation. Joint pains were partly alleviated in the majority of patients after the first

treatment. A few patients complained of increased joint pain following treatment. One patient had severe chills about three hours after his fifth injection. Headache was a frequent complaint.

Two patients, who respectively had their tonsils and teeth removed about two months prior to treatment, complained of severe burning pain in the tonsillar area and severe pain at the site of the extracted teeth during the administration of the solution. One patient was given seven one-gram injections and one 1¼-gram injection. There was no complaint of reaction of any character during or following the administration of the drug; nor was there any improvement. It must not be reasoned from this particular case that the beneficial effect of amiodoxyl benzoate is dependent upon the severity of the reaction as is probably true in the treatment of arthritis with nonspecific proteins. A comparison of treatment with dead typhoid vaccine and amiodoxyl benzoate is given by Young.<sup>18</sup>

#### ADMINISTRATION

Atropin sulphate, grains 1/100, was given twenty minutes before the injection of amiodoxyl benzoate, but did not seem to affect the severity of the reaction. Adrenalin, one-half cubic centimeter, given in the same manner diminished the severity of the reaction in some cases.

Injections were usually given every three days. Lately we have given five patients daily injections of 100 cubic centimeters of the 1 per cent solution for eight days. In two patients reactions were of the usual character and severity. One patient developed cramps, diarrhea, and weakness after the fifth daily one-gram injection. These symptoms did not recur after the following injection. After the fifth injection another patient developed an erythematous rash, without purpura, which subsided in five hours without recurrence. No change in the original complete blood count was noted after the eighth injection. Burning and frequent urination, following treatment, was the chief complaint of another patient whose urine contained a few red blood cells before treatment. There were no subsequent abnormal urinary findings. The progress of the patients given daily treatments was about the same as that made by those who were given the treatment at three-day intervals. We believe that treatments may be given every other day with safety. We would like to reserve opinion on daily injection until further study.

Smith<sup>6</sup> has advised modification of the dose according to body weight, recommending that those below 110 pounds be given an initial dose of not over .3 gram, and subsequent doses up to .7 gram; while those over 110 pounds should receive an initial dose of .5 gram and subsequent doses of 1 gram.

The average time allowed for injection was about fifteen minutes. If the symptoms of toxicity were marked, more time was allowed for administration. In most patients the severity of the reaction seemed to depend upon the rate of injection; however, this rule did not always hold true. The same patient often complained of

equally severe symptoms from an injection given in fifteen minutes as from an injection given in seven minutes. The severity of the reaction varied in different individuals.

In five instances we gave the 100 cubic centimeter solution in three minutes with no more than the ordinary reaction. This increased rate of injection was attempted in other instances, but was discontinued on account of the severity of the reaction.

We must not forget that a fatality occurring seven hours after the administration of amiodoxyl benzoate has been reported.<sup>4</sup> The evidence, however, is not conclusive that the drug was responsible for the patient's death. A death twenty-four hours after administration is mentioned by Young and Youmans.

Six or eight injections have constituted a "course" of treatment. We have repeated the "course" in some cases after a two-week interval. No patient has received more than twenty-three injections. Smith<sup>6</sup> gave thirty-two injections to one patient without apparent harm.

Six injections should be given before deciding that the treatment is of no value in any given case.

Blood pressure readings were taken at ten to fifteen-minute intervals. In from ten to forty-five minutes (average eighteen minutes) there was a marked rise in blood pressure averaging eighteen points. After this time there was a gradual fall in pressure until, at the end of one and one-fourth hours (average) the blood pressure was fourteen points (average) below the reading taken before injection. The blood pressure returned to normal in from two to six hours.

Pulse pressure varied *pari passu* with the blood pressure. A rise in temperature of .5 to 1 degree was occasionally noted. The temperature rose from 100 to 104 degrees following the injection in one patient with acute arthritis. The pulse was usually depressed from 5 to 20 points, returning to normal in from two to four hours. The respiratory rate was seldom affected.

These conclusions agree fairly well with those given by Trauba.<sup>11</sup>

No trouble was experienced with thrombosis of the veins following treatment. All veins were washed with normal saline, following the injection of amiodoxyl benzoate.

All patients were given physiotherapy in the form of radiant heat, diathermy, massage, and active and passive motion. We believe that physiotherapy, directed by an expert, is a most valuable adjunct to any type of treatment for arthritis. Amiodoxyl benzoate, by relieving pain and muscle spasm especially in the chronic cases, simplifies the task of the physiotherapist in obtaining early active and passive motion. All probable foci of infection were eliminated in the patients with infectious arthritis before treatment with amiodoxyl benzoate.

We should be very conservative in the elimination of possible foci of infection in patients suffer-

ing from the degenerative type of arthritis, as a true focus of infection is rarely demonstrable.

Treatment of joint pain should not be the only consideration in advising a regimen for arthritis, especially of the degenerative type. Diet is an important feature of treatment, as these patients are usually overweight. Methods for improving the circulation and elimination are important features in their care. Pemberton<sup>24</sup> advises a diet of 30 calories per kilo, with 30 per cent of calories derived from carbohydrates; 10 to 15 per cent from protein; and 40 to 50 per cent from fat, the total caloric intake depending on the individual's weight and previous caloric intake. Decided improvement in metabolism and tissue turgor may be accomplished in patients with a low basal metabolic rate by the administration of thyroid extract.

The quartz mercury lamp is valuable on account of its general tonic effect.

The general use of amiodoxyl benzoate should be limited to patients whose mechanical joint changes are not sufficient to preclude the possibility of improvement in function. To other patients it may be given as a palliative for pain. Gout was considered as a possible diagnosis in all cases, and blood uric acid determinations were always obtained.

In selecting cases for treatment, we cannot expect as favorable results in patients with marked bony changes and deformities as in those with no x-ray evidence of joint disease and little deformity or crippling.

#### RESULTS OF TREATMENT

In reporting our results we would like to emphasize that each individual was placed on a regimen best suited to his needs and directed particularly toward improving his general physical condition.

Twenty-six patients were treated and sufficient time allowed to judge results, most of the patients being followed for over a year.

For comparison we have listed our results in tables similar to those used by Youmans.<sup>12</sup>

Twenty-six patients have been given a total of 182 injections. The majority have received only one, or less than one course of treatment. The ages vary from 18 to 75; the greatest numbers are found in the age groups 40 to 49 and 50 to 59. The disease was acute in five, and chronic in twenty-one patients. There were thirteen cases of infectious arthritis. Ten of these were of non-specific focal origin. In three the disease was acute, and in seven it was chronic. There were two cases of acute and one of chronic gonorrheal arthritis. There were thirteen cases of degenerative arthritis of which seven were menopausal and six senile. In the acute cases the duration of disease was from five days to two months. In the chronic cases the duration was from nine months to twenty years.

Many factors must be taken into consideration in deciding the degree of improvement. Improvement in one case may mean loss of pain and swelling, while in another it may mean partial or complete restoration of function. If the patient has not been able to climb stairs for months and he

TABLE 1.—Summary of Results

Improvement	No. Cases	Per Cent
Marked .....	12	46
Moderate .....	8	31
Slight .....	4	15
None .....	2	8
Total .....	26	100

TABLE 2.—Age of Patients and Relation to Improvement

Age of Patients	No. Cases	IMPROVEMENT			
		Marked	Moderate	Slight	None
10-19 .....	1	1			
20-29 .....	1	1			
30-39 .....	4	3	1		
40-49 .....	6	1	3	1	1
50-59 .....	6	2	1	2	1
60-69 .....	5	3	2		
70-79 .....	3	1	1	1	
Total .....	26	12	8	4	2

is able to do so after treatment, he is obviously classed as markedly improved. The estimation of the degree of improvement is relative with each patient and more or less a personal matter with each investigator.

All patients had some disability, varying from pain and swelling to partial ankylosis. Disability limited to pain and swelling was not considered as crippling. Disturbance in function or crippling, varying from muscular spasm to partial ankylosis, was classed as slight, moderate, and severe.

Opinions as to the value of this treatment vary with different investigators. Results cannot be satisfactory if many cases of arthritis with advanced bony and cartilaginous changes are treated, as when treatment is limited to carefully selected cases offering good chances for improvement in function. Other general measures outlined in this paper are important factors in obtaining the best results.

TABLES SHOWING RESULTS

The general results of this treatment are summarized in Table 1. Of the twenty-six patients, twelve, or 46 per cent, were markedly improved; eight, or 31 per cent, were moderately improved; four, or 15 per cent, were slightly improved, and two, or 8 per cent, received no benefit.

Somewhat better results are obtained in the younger patients (Table 2). Twelve patients between the ages of eighteen and forty-nine were treated; ten of these were markedly or moderately improved. However, in the group of fourteen patients over fifty years of age who were treated, ten were markedly or moderately improved.

The degree of deformity or crippling is an important factor in determining the likelihood of

TABLE 3.—Degree of Crippling and Relation to Improvement

Degree of Crippling	No. Cases	IMPROVEMENT			
		Marked	Moderate	Slight	None
None .....	2	2			
Slight .....	1		1		
Moderate .....	10	5	1	2	2
Severe .....	13	5	6	2	
Total .....	26	12	8	4	2

TABLE 4.—Duration of Disease and Relation to Improvement

Duration	No. Cases	IMPROVEMENT			
		Marked	Moderate	Slight	None
Acute .....	5	4	1		
6 mo.—1 yr. ....	6	3	2	1	
1-2 yrs. ....	4	1	2	1	
2-5 yrs. ....	3	1	1	1	
5-10 yrs. ....	5	2	1		2
Over 10 yrs. ....	3	1	1	1	
Total .....	26	12	8	4	2

improvement (Table 3). Only two patients in our series had no deformity—both were markedly improved. One with slight crippling was moderately improved. Of the ten with moderate crippling, five, or 50 per cent, were markedly improved; but of the thirteen with severe deformity only five, or 38 per cent, were markedly improved.

In our series of cases, the shorter the duration of the arthritis the greater was the percentage of marked improvement (Table 4). However, of the patients who had the disease from five to twenty years, 38 per cent were markedly improved.

The cases are evenly divided between the proliferative and degenerative types of arthritis (Table 5). In the first-named group of thirteen patients, there was 54 per cent of marked improvement. In the group of thirteen patients with degenerative arthritis, only 38 per cent showed marked improvement. This is a greater per cent of improvement than we expected in this group.

Table 6 shows that seven, or 58 per cent, of the patients who received less than one course of treatment showed marked improvement. Of these, three cases were acute infectious; two were chronic infectious and two were degenerative. Five, or 42 per cent, of those who had one course of treatment showed marked improvement. The two patients who had two courses showed only moderate improvement. Of these, one patient

TABLE 5.—Type of Case and Relation to Improvement

Type of Case	No. Cases	IMPROVEMENT			
		Marked	Moderate	Slight	None
Infectious (Proliferative)					
Acute, non-specific .....	3	2	1		
Chronic, non-specific .....	7	2	2	2	1
Acute Gonorrheal ..	2	2			
Chronic Gonorrheal ..	1	1			
Degenerative					
Menopausal ....	7	3	3	1	
Senile .....	6	2	2	1	1
Total .....	26	12	8	4	2

TABLE 6.—Amount of Treatment and Relation to Improvement

Amount of Treatment	No. Cases	IMPROVEMENT			
		Marked	Moderate	Slight	None
Less than one course .....	12	7	3	2	
One course .....	12	5	3	2	2
Two courses .....	2		2		
Total .....	26	12	8	4	2

had acute infectious and the other degenerative arthritis.

Amiodoxyl benzoate seems efficacious in the treatment of sciatica. Six patients were given six or more injections of the drug; four showed marked improvement and two showed slight or no improvement.

We are not assuming that amiodoxyl benzoate was wholly responsible for the good results obtained. Physiotherapy, diet, and all general measures instituted, exclusive of removal of foci of infection, may have been important factors, especially in the degenerative type of arthritis. We do not believe that any drug or single therapeutic procedure will accomplish all the desired results. Arthritis is a complex therapeutic problem, and each patient suffering from the disease requires intensive individual study and treatment.

#### THEORIES REGARDING ACTION

Many theories have been advanced to explain the mode of action of amiodoxyl benzoate. We know that oxidizing agents increase reparative processes and delay destructive processes. Arkin demonstrated the germicidal effect of sodium iodoxybenzoate and its stimulating effect on phagocytosis of staphylococci and streptococci by human leukocytes in the presence of human serum. Rohdenburg and Reich have confirmed the former action. Hektoen noted the increased antibody production in dogs receiving this substance. This stimulation of antibody production was verified by Arkin.

Loevenhart and Grove demonstrated the effect of sodium iodoxybenzoate on an isolated loop of intestine. The dilatation of the blood vessels, they concluded, was dependent on their connection with the nervous system. The fall in blood pressure seemed to be due to depression of the vasomotor center. They believed that the occasional rise of blood pressure was caused mainly by increased cardiac output, although they did not exclude the possibility that, under certain conditions, the salt may have stimulated the vasomotor center. Pemberton and others have investigated the possible relationship between changes in circulation with concomitant delayed removal of sugar and failure of removal of oxygen in normal amounts and the occurrence of arthritis.

Rowntree and Adson<sup>25 26</sup> have reported one case of severe polyarthritis of the lower extremities in which bilateral lumbar sympathetic ganglionectomy and ramisectomy was done with encouraging results. Leriche<sup>27</sup> has noted that trauma of an articular region produced a hyperemic reaction at this level. If the hyperemia persisted for longer than ten days, synovitis with hydro-arthritis occurred, especially if the synovia was of great size. Osseous and cartilaginous changes followed. Sympathetic operations modify the vasomotor condition by decreasing hyperemia, and are very effective in the treatment of traumatic arthritis.

It is not unreasonable to assume that amiodoxyl benzoate may so alter vasomotor conditions as to increase circulation of the joint by capillary dilatation. This latter action, if proven, may be re-

sponsible for some of the good results obtained in the degenerative type of arthritis.

Many patients have spoken of the improved color and increase in warmth of the lower extremities following treatment. In some patients we have noticed that the newly appearing proximal portions of the nails looked normal, while the distal portion was of the "trophic" type.

It would be interesting to determine the surface temperature and transference of heat from the extremities following the administration of amiodoxyl benzoate.

#### CONCLUSIONS

1. Arthritis is a complex problem which demands individual personal attention as to details of diagnosis and treatment.

2. The elimination of foci of infection, diet, physiotherapy, and special treatment instituted toward improving the patient's general physical condition are important factors in treatment.

3. The uses, dosage, administration and possible action of amiodoxyl benzoate are discussed.

4. The results of the treatment of twenty-six cases of arthritis are reported, and it is suggested that the use of the drug should be limited to those patients whose joint pathology is such that there is a reasonable possibility of improvement in function.

5. Amiodoxyl benzoate may be given as a palliative measure for pain.

Woodland Clinic.

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#### DISCUSSION

GEORGE C. HENSEL, M. D. (Fitzhugh Building, San Francisco).—Doctor Harbinson has given us a timely discussion of a very useful drug in the treatment of one type of arthritis. His conclusions define its clinical use and value accurately. I am quite in agreement as to its expressed value because of my own experience with the drug and from personal observation of the majority of Doctor Youmans' original series published in 1926.

Amiodoxyl benzoate is more successfully employed in those cases of proliferative arthritis having an infectious origin. Its most favorable influence is seen in that proliferative group determined by genitourinary Neisserian infection. Many of the proliferative, or so-called infectious arthritides are, however, not demonstrably, from either the clinical or experimental sides, an effect of focal infection. The lack of notable

improvement in certain proliferative cases may be explainable on this fact. Though occasional favorable response is obtained with the drug in hypertrophic or degenerative arthritis, such response is little and transient when present, and its general usage is definitely not indicated in this group.

The proper usage of amiodoxyl is, therefore, dependent on accurate recognition of the type of arthritis at hand.

Many reports questioning its value rather clearly demonstrate improper usage of the drug. In several reports there is an evident misunderstanding of the type of case favorably influenced, and the circumstance of its management, as originally defined by Young and Youmans. Doctor Harbinson has again clearly called attention to these two points.

The drug should be used in connection with other therapeutic indications. Its isolated use, or usage under ambulatory conditions promises little more than failure.

The local care of involved joints should be axiomatic in arthritis. The proliferative types with progression lead to crippling and pitiful deformities that only too often must be charged to negligent management. No local curative change is to be expected in the presence of structural changes of synovial membrane, cartilage, or bone.

All Youmans' cases were cared for conjointly with the orthopedic surgeon.

Finally I should like to call attention to its value as a preoperative measure in proliferative cases where surgery is indicated; much after the manner in which Lugol's solution is used preoperatively in cases of hyperplasia of the thyroid gland.

Also the prophylactic use of amiodoxyl in possibly inhibiting progression locally in the joint and, like added involvement of other joints, may be considered a definite indication for usage. Efficiency in this regard is not a matter of certainty at the present time.



GEORGE B. WORTHINGTON, M. D. (902 Medico-Dental Building, San Diego).—Doctor Harbinson has given a very comprehensive and practical résumé of his technique and results of treatment with amiodoxyl in his series of cases of arthritis.

We have used this drug in twenty-seven cases of this disease at the San Diego County General Hospital over a period of more than two years, and feel that, on the whole, our results are somewhat disappointing. Seventeen cases were classified as the proliferative or atrophic type (first great group of Ely), eight were of the degenerative (type 2) form, and two had a quite definite gonorrheal etiology. Our technique was quite similar to that of the author, but in no cases were treatments given daily. Doctor Harbinson's experience with these frequent injections is quite interesting in view of the fact that it demonstrated the comparative lack of toxicity of the drug, even though no particular advantage was apparent from its daily use. The patients were given from one to four courses of six doses each, with an interval of five or six weeks between each course. In those who were improved by this drug, the fourth course produced no marked change for the better. With few exceptions, we noted no severe reactions in any of our cases, and had no fatalities. In one case, a woman of middle age with a moderate hypertension, rather alarming symptoms appeared immediately following the injection, and we feel that the drug should not be given to hypertensives nor to those showing renal impairment or in cases of tuberculosis unless ancient and entirely inactive.

*The proliferative cases, especially those of fairly recent origin with very little pathology, showed the most marked improvement*, as did those traced to a definite gonorrheal infection. We were gratified with the results in four cases of this group. Alleviation of pain, some lessening of swelling, stiffness and soreness of the

joints, depending on the severity of the process, were noted in the others of this type.

In the hypertrophic cases the results, outside of some temporary increased comfort, were quite discouraging. One cannot expect to influence cases with marked mechanical changes or ankylosis.

All of our cases were given physiotherapy and a diet suited to their needs, with a low carbohydrate intake as suggested by Pemberton in the degenerative form, especially to the obese. Thyroid was often used with benefit in these cases and in those where the menopause was considered to be a factor. There is no doubt that all of these measures must be used if the patient is to be restored to any degree of functional activity, freedom from pain, and the inroads of this most disheartening disease checked. The earlier and more persistently such measures are used the better will be the final results.

All foci should be removed if possible, but this should be done cautiously after the patient's resistance has been built up somewhat, so that he is better able to withstand a flooding of the system with infective material, often leading to a generalization and increase in severity of a comparatively mild arthritis. This has happened on more than one occasion to the discomfiture of the physician. We have noted, on more than one occasion, marked improvement following the cleaning up of pathogenic protozoa in the intestinal tract as advocated by Dr. John V. Barrow and others, and make this a routine procedure where *Ameba histolytica* is found.

Occupational therapy is very beneficial in limbering up stiffened joints. Some of our patients who seemed hopelessly crippled at the start are now able to turn out some excellent articles in tooled leather. This promotes a happier mental attitude and provides a means of livelihood, as well as being of real aid in loosening up the stiffened fingers, wrists, and elbow.

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DOCTOR HARBINSON (Closing).—Doctor Worthington does not mention the degree of bony change present in the patients he has treated. The majority of county hospital patients suffering from arthritis usually show very extensive x-ray evidence of arthritis and are not helped appreciably by amiodoxyl benzoate. Results vary according to the selection of cases.

Doctor Hensel has stressed the importance of accurate diagnosis and emphasizes the fact that lack of improvement in certain cases of proliferative arthritis, in which we normally might expect good results, may be due to an erroneous diagnosis.

Possible demonstration of the germicidal effect of amiodoxyl benzoate in one of our patients is evidenced by the x-ray report before treatment which read: "Infectious arthritis of destructive type, involving anterior surface of tibio-astragalar joint, chiefly the tibial surface." One month later, after the patient had received eight injections of amiodoxyl benzoate, and was free from pain, the x-ray report read: "Considerable restitution of joint surface and bone, previously reported as destroyed."

We have been favorably impressed with the value of amiodoxyl benzoate as an adjunct in the treatment of hypertrophic arthritis. Many patients over sixty-five, who have been practically bedridden before treatment, have been free from pain and able to walk with the aid of a cane after treatment. Some of these patients have been observed for over a year. We are not attributing these results to the use of amiodoxyl benzoate alone, but believe that it has been a most valuable aid in the treatment. Patients of this type who were benefited by one course of treatment, but whose symptoms returned were again relieved by another course of treatment.

No promises are made as to results, amiodoxyl benzoate being used strictly as a palliative measure. We are prone to consider that arthritis in these elderly people is a heritage and that "nothing can be done but let the disease run its course." We believe that many of these patients can be relieved for long periods of time by measures suggested in this paper.

## PARTIAL GASTRIC RESECTION UNDER LOCAL ANESTHESIA\*

By FLOYD F. HATCH, M. D.  
Salt Lake City, Utah

THERE is an old medical axiom that the cure must not be worse than the disease. For purposes of analysis and consideration, various features which concern the multiple methods of treatment in diseases of the stomach should be carefully estimated before a surgeon resorts to any radical operative procedure. Surgery of the future will be identified not so much by new processes as by increased finesse in technique. Instruments of greater precision and a preoperative and post-operative regimen that will eliminate a great number of present cases of unnecessary mortality and morbidity will be perfected.

An era of progress is at present being evolved in the treatment of gastro-intestinal lesions based on more accurate diagnosis and preparation of the patient and more skilled surgery. This includes the use of local anesthesia, the choice of appropriate surgical procedure, and a technique featured with gentleness which pays high dividends in lowering the surgical complications of older methods.

### INDICATIONS FOR PARTIAL GASTRIC RESECTION

Partial gastric resection is indicated whenever its performance is possible in *carcinoma of the stomach*.<sup>1</sup> Attempted palliative operations are rarely ever beneficial, and gastro-enterostomy should not be done except in the presence of obstruction unless as a first-stage operation to a subsequent and often much easier resection. In this regard a word should be added urging avoidance of incomplete operations, as primary operations often can easily be performed completely with no more risk than an incomplete one, or one intended as a first stage.<sup>2</sup>

In *certain gastric ulcers* partial gastric resection by one of several methods, each of which has ardent advocates, has its apparent indications according to reports by Balfour, Lewisohn,<sup>3</sup> and others in this country. Finsterer,<sup>4</sup> Von Haberer,<sup>5</sup> Neuber, and other European surgeons in their recently reported conclusions based on the study of a large number of cases recommend that all gastric and duodenal ulcers be treated without exception by partial gastric resection.

Partial gastrectomy for *chronic gastric ulcer* guarantees the safe, complete removal of the ulcer; removal of multiple ulcers (often overlooked) is assured. This means removal of the "ulcer-bearing" portion of the gastric mucosa, and is the greatest insurance against a recurrence. The danger of cancer following local resection variously estimated at from 2 to 20 per cent is eliminated in cases of malignant degeneration of ulcer, or lesions already carcinomatous, by partial resection. Recurrence of ulcer after a previous pre-

\* From the Surgical Section, Intermountain Clinic, Salt Lake City.

\* Read before the Salt Lake County Medical Society on September 24, 1928.